

What is claimed is:

1. A hydraulic steering system for vehicles comprising:
a hydraulic steering unit including a steering
5 element for receiving steering input from an operator;
a closed-circuit pump in communication with the steering unit wherein the steering unit actuates the closed-circuit pump; and
10 at least one steering cylinder in communication with the closed-circuit pump wherein the closed-circuit pump actuates the steering cylinder to control the steering of the vehicle.
- 15 2. The hydraulic steering system of claim 1 wherein the closed-circuit pump is a proportional bi-directional pump.
- 20 3. The hydraulic steering system of claim 1 wherein the steering unit includes at least one servo pump in communication with the closed-circuit pump to actuate the closed-circuit pump.
- 25 4. The hydraulic steering system of claim 1 wherein the steering cylinder includes at least one counterbalance valve along the inlet to the steering cylinder to prevent actuation of the steering cylinder when there is no steering input from the operator.
- 30 5. The hydraulic steering system of claim 1 wherein the steering element comprises a steering wheel.

6. A hydraulic steering system for vehicles comprising:
an electronic displacement control unit including a
steering element for receiving steering input
from an operator;
a closed-circuit pump in communication with the
electronic displacement control unit wherein the
electronic displacement control unit actuates
the closed-circuit pump; and
at least one steering cylinder in communication with
the closed-circuit pump wherein the closed-
circuit pump actuates the steering cylinder to
control the steering of the vehicle.
7. The hydraulic steering system of claim 6 wherein the
closed-circuit pump is a proportional bi-directional
pump.
8. The hydraulic steering system of claim 6 wherein the
steering cylinder includes at least one
counterbalance valve along the inlet to the steering
cylinder to prevent actuation of the steering
cylinder when there is no steering input from the
operator.
9. The hydraulic steering system of claim 6 wherein the
steering element comprises a steering wheel with
electronic encoding devices that relays an electronic
signal to the electronic displacement control unit.
10. The hydraulic steering system of claim 6 wherein the
steering element comprises a joystick that relays an

electronic signal to the electronic displacement
control unit.